

WAFER BONDING USING REACTIVE FOILS FOR MASSIVELY PARALLEL MICRO-ELECTROMECHANICAL SYSTEMS PACKAGING

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FIELD OF INVENTION

B [0001] This invention relates to the use of reactive foils for wafer bonding and for forming device packages.

DESCRIPTION OF RELATED ART

[0002] Wafer bonding techniques are used in IC (integrated circuit) and MEMS (micro-electromechanical systems) manufacturing. By achieving package function at the wafer level, it is possible to realize cost savings via massive parallel assembly. While MEMS packaging has been incorporated at the device fabrication stage of the micromachining process, there is a need for a more uniform packaging process to produce higher yields and to lower costs. Hermeticity and low-temperature sealing are two key elements that present formidable challenges to the goal of process uniformity.

[0003] MEMS devices and IC's are generally fragile devices that are sensitive to high temperatures and high voltages required for conventional wafer bonding techniques. Conventional wafer bonding techniques include anodic bonding, intermediate-layer bonding, and direct bonding. Anodic bonding typically takes place at 300 to 450°C and requires the application of high voltages. Direct bonding typically takes place at 1000°C and requires extremely good surface flatness and cleanliness. Intermediate-layer bonds are typically formed with brazes or solders such as AuSi (gold silicon), AuGe (gold germanium), and AuSn (gold tin). All of these brazes and solders have melting temperatures that can degrade temperature sensitive materials and devices.

[0004] Thus, what is needed is a method that bonds wafers without exposing MEMS devices and IC's to high temperatures and high voltages.